



# Stream Health and the Aquatic Macroinvertebrate Long-Term Ecological Monitoring Program

## Introduction

There are approximately 240 species of aquatic macroinvertebrates known in Shenandoah National Park. Aquatic invertebrate samples have been collected on certain streams in the Park since 1986. Sampling was a direct response to the wave of gypsy moth (*Lymantria dispar*)

defoliation in the southeastern United States. Aquatic insects have been used as indicators of stream health for many years. Different assemblages of insects have the ability to show variations in streamwater chemistry and flood and drought cycles.

## Advantages of Sampling Macroinvertebrates

Aquatic insects are numerous, have short life cycles, and are directly affected by changes in water chemistry and flow. These factors coupled with relative ease of sampling, makes them excellent indicators of aquatic ecosystem health. There is also

more species diversity in the insect community than more highly visible organisms such as fish. A change in species composition is relatively easy to detect and can then be used to assess stream decline or recovery.

## Management Needs

Surface water originating in Shenandoah National Park ultimately flows through 51 counties in 3 states and the District of Columbia. Shenandoah National Park staff have sampled aquatic macroinvertebrates for 19 years. As stated above, the program was started in response to gypsy moth defoliation but the data can be used to assess many impacts such as trail and road erosion, road salt contamination, wastewater treatment

plant effluent, past land disturbance, and acidification due to acid rain. Park staff members have sampled all streams known to harbor native brook trout (*Salvelinus fontinalis*) and have sampled eight of eleven streams known to be low in acid neutralizing capacity (ANC) yearly for the past six years. ANC is characterized as the ability of the geologic type neutralize (buffer) acid.

## Current Procedures

Since 1993, data has remained consistent with one technician taking the bulk of the quantitative samples each year. Stream habitat data is collected at each site and the invertebrates are sent to Virginia Tech for identification within one month of the final sampling date each year. All data is entered into Microsoft Access. To date, 112 sites in 54 drainages have been sampled. There are roughly 81 "permanent" drainages that exit the Park.



Park employee using a Portable Invertebrate Box Sampler (PIBS) on the Staunton River, April 2003.

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## What We Have Learned

Happy Creek in Warren County sampled May 2004.

A recent project looked at current and past land use in concert with invertebrate data. This was then compared to other data collected throughout the Blue Ridge region. From this work it was determined that Park streams appear to have recovered from land use practices prior to Park establishment, and that the roads, trails, and wastewater treatment plants are not causing any discernable impacts in the aquatic invertebrate assemblage.

There are six major geologic types which compose 18 variations of rock strata in the drainages sampled to date. The only streams that stand out as having a different aquatic macroinvertebrate community structure are in the siliciclastic formations. Streams that flow over siliciclastic bedrock are considered low ANC streams. There is no clear break in aquatic invertebrate

communities within the granitic or basaltic geologic types. Analysis is continuing on a stream by stream basis and may show differences in flood and drought effects as more data is analyzed.



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## References

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